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May 13, 1982

City of Toronto Noise
Control Programme -
Progress Report No. 1.

Alderman Dorothy Thomas,
Chairman and Members of the
City Services Committee.

Ladies and Gentlemen:

I submit hereafter Progress Report No. 1 on the City of Toronto Noise Control Programme.

This Report describes the work done since 1974 and outlines a recommended course of action for the future.

All of which is respectfully submitted.

R. M. Bremner, P.Eng., F.I.C.E.,
Commissioner of Public Works
and City Engineer.

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INTRODUCTION

City Council in December of 1973, adopted a noise control programme based on the following fundamentals for action:

1. All aspects of future development and land use planning to be evaluated in light of their impact on the sound environment of the City.

2. Seek the co-operation of the senior levels of Government in modifying the noise production qualities of aircraft, rail systems, buses, trucks, automobiles, motorcycles, etc.

3. Ensure that all construction and refuse collection equipment operated within the City is regulated in relation to sound producing capability.

4. Ensure that building codes embrace "as built" sound attenuation standards and that controls on the sound potential of associated service equipment is an integral requirement in new construction.

5. Establish the required management system for maintaining the monitoring and control of noise in the City.

6. Revamp and revise the City's existing Noise Control By-law to suit current and future needs.

My recommended programme was conceived on two key principles. Firstly, that sound must be eliminated at the source and secondly, that ambient noise standards not be adopted or used for the purpose of policing the City's sound environment.

The responsibility for the administration and operation of the Noise Control Programme was placed under a noise control group within the Environmental Engineering Branch of my Department. The Metropolitan Toronto Police Commission was to be involved in the receiving of complaints and enforcement of the nuisance and vehicle infringement sections of the proposed new noise by-law.

This Progress Report covers the work that has been completed during the period 1974 to 1982 on the implementation of the City's Noise Control Programme and also sets out requirements for the foreseeable future.

SECTION 1 - WORK OF THE NOISE CONTROL BRANCH

The Noise Control Branch is headed by the Noise Control Co-ordinator who is responsible for the direction of a staff of seven. The Branch is located at the Eastern/Booth Yard of the Department of Public Works and carries out the following work:

(a) enforcement of the City's Anti-Noise By-law

(b) dealing with citizens' complaints

(c) noise monitoring

(d) sound attenuation of City equipment

(e) neighbourhood surveys

(f) public education programmes

CITY'S NOISE BY-LAW AND ENFORCEMENT

City Council passed a new Anti-Noise By-law No. 44-75 on October 1, 1975. The By-law is conceived on the basis that the work of enforcement is carried out by the Metropolitan Toronto Police Department and my Noise Control Branch. Generally speaking, the technical portions of the By-law are enforced by my Noise Control Branch while those aspects which relate to noise produced on a sporadic and unplanned basis and which elicit complaints requiring immediate action are enforced by the Metropolitan Toronto Police. A short precis of the By-law is shown in Table No. 1. The By-law has worked well and has permitted effective control of the noise environment in the City.

CITIZENS' COMPLAINTS

The analysis of Toronto's sound climate during the past eight years has shown that sound pressure levels have not increased in most areas; nevertheless, it is evident that Toronto citizens are concerned with noise and complaints have increased steadily over the past eight years as shown in Table No. 2.

TABLE NO. 1

TABLE NO. 1

CITY OF TORONTO ANTI-NOISE BY-LAW

Sec. 3 Sub-Section	Type of Noise	PROHIBITED			ENFORCED BY		Note
		At Any Time	Bet. Hours	Over dB(a) Level	Police	Noise Control	
A	yelling, shouting	X			X		call Police while noise is going on
B	shouting of pedlars	X			X		call Police while noise is going on
C	animals, birds	X			X		call Noise Control - info. letters & warnings sent to complainant & owner
D	model planes, toys, hobby equipment		2100-0730		X		call Police while noise is going on
E	radio, loudspeaker, hi-fi, musical instruments, etc. being projected over lot line		2100-0730		X		call Police while noise is going on
F	noise as in 'E' being projected into a home or office	X			X		call Noise Control - info. letter will be sent to complainant & arrangements made for investigation by Police Community Relations Officer
G,H,I	horn, streetcar bell (except emergency) (when traffic stopped) (unreasonable time)	X			X		call Police while noise is going on
J	vehicle out of repair	X			X		call Police while noise is going on
K	faulty muffler, or no muffler	X			X		call Police while noise is going on
L	power lawn mowers, etc. EXCLUDING snow blowers		2100-0730 Sun/Hol -0900		X		call Police while noise is going on
M	factory whistle, burglar alarms (except in danger)	X			X	X	
N	loudspeaker, etc. projecting into the street	X			X	X	
O	window air conditioner		2300-0730			X	prohibited if noise at disturbing level in complainant's home
P	ventilator, central a/c			X		X	
Q	machine or engine exhaust	X				X	
R	public transit noise	X				X	
S	loading/unloading vehicles	X				X	
T	garbage trucks, bulk lift		2100-0700 Sun 0900			X	prohibited during hours noted except in case of public convenience or necessity if audible in residential zone
U	construction sites		1800-0700			X	noise, if at disturbing level, prohibited during hours noted except in case of public convenience or necessity
V	radio on boat or vehicle	X				X	

TABLE NO. 2

DEPARTMENT OF PUBLIC WORKS - NOISE COMPLAINTS RECEIVED 1974 - 1981

Category	1974	1975	1976	1977	1978	1979	1980	1981	Total	%
Animals	81	151	180	271	251	282	464	428	2108	33
Music, Loudspeakers	78	94	76	97	173	155	138	230	1041	17
Air Conditioning	45	91	97	121	114	107	85	129	789	13
Construction	74	99	63	91	105	103	104	84	723	12
Industrial	21	31	49	50	92	33	24	23	323	05
Refuse Collection	19	24	39	41	45	53	54	56	331	05
Public Transit	10	8	2	19	17	19	16	21	112	02
Property Service Equipment			18	23	6	24	33	21	125	02
Miscellaneous	83	128	70	65	45	58	100	107	656	11
Totals	411	626	594	778	848	834	1018	1099	6208	100

The nature of complaints in most categories have remained fairly constant. However, there are significant increases in the number of complaints from radios, loudspeakers and air conditioners. While many complaints are under police enforcement, most are initially made through my Noise Control Branch. A preliminary investigation will often result in a solution to the problem, but failing this, the detailed information obtained by my Noise Control Branch can be turned over to the police. When circumstances warrant, a letter is sent to the complainant explaining how acceptable evidence can be collected for use by the police in their investigation.

From time to time, complaints arise from violations of by-laws under the jurisdiction of other Civic Departments; for example, the operation of a kennel or a noisy business in a residential district or a complaint from noise caused by disrepair in a neighbouring house would be referred to the Department of Buildings and Inspections.

In the course of investigating a citizen's complaint, the following procedures are followed:

(a) establish the validity of the complaint

(b) determine the source of the noise

(c) decide whether the noise can be eliminated, reduced or confined to certain hours

(d) persaude the producer of the noise to reduce or eliminate the noise

(e) ensure that all parties are kept informed of further developments

(f) establish a dialogue between the complainant and the producer of the noise.

My staff attempts to represent neither the complainant nor the noise producer and in a sense will act as a referee and decide whether there is justification for the complaint. Thereafter, the inspector assumes the role of a mediator.

While every effort is made to resolve noise complaints without recourse to the courts, prosecutions at times have taken place. To date, 71 charges have been laid. Convictions have been obtained in 63 instances while charges in 8 cases were dropped at my request when the noise source was permanently eliminated. Table No. 3 shows the nature of prosecutions carried out between 1974-1981.

TABLE NO. 3

DEPARTMENT OF PUBLIC WORKS - NOISE PROSECUTIONS
1974 - 1981

Category	Total	%
Animals	3	4
Music, Loudspeakers	51	72
Air Conditioners	9	12
Construction	4	6
Industrial	2	3
Refuse Collection	2	3
Totals	71	100

NOTE: Prosecutions under former Anti-Noise By-law No. 14913 and under Environmental Protection Act 1971 included.

The greater proportion of complaints investigated for possible by-law violation are as follows:

BARKING DOGS

More people in the City of Toronto are disturbed by noise from barking dogs than by any other noise source. Section 3(c) of the Noise By-law prohibits

any person from permitting disturbing noise from barking dogs. While this section of the By-law is enforced by the Metropolitan Toronto Police, my Noise Control Branch will, on receipt of a complaint, contact the dog owner advising him of the complaint and of the provisions of the By-law. The owner is given a suggestion in the way of controlling the barking of his dog and the complainant is advised that the dog owner has been warned. The complainant is requested to contact the Police while the dog is barking in order that an officer may witness the offence and lay charges if necessary.

The Police, understandably, cannot give high priority to barking dog complaints and often, by the time they are able to respond, the barking has ceased and no evidence can be collected. The Animal Control Sub-Committee in its draft report on Proposals for Animal Control has proposed that a ticket system be initiated to allow for easier and faster enforcement of the By-law. The Toronto Humane Society Inspectors, in addition to the Police, will be authorized to issue the tickets. I believe that this course of action will improve the effective application and enforcement of this Section of the Noise Control By-law.

Recommendation

That City Council endorse the draft proposal of the Animal Control Sub-Committee to initiate a ticket system for the enforcement of violations of the City's Anti-Noise By-law with respect to barking dogs, with the enforcement being undertaken by the Metropolitan Toronto Police Force and officials of the Toronto Humane Society.

MUSIC, LOUDSPEAKERS, ETC.

Enforcement of the prohibition of the projection of noise into any street or public place has proven effective, especially on Yonge Street, between King and Bloor Streets, where a total of 28 convictions were obtained in 1974 and 1975 against businesses using loudspeakers for advertising purposes; few complaints of this type of noise are now being received. The increased ownership of professional/quality sound equipment is reflected in the steady increase of complaints from persons disturbed in their homes by intrusive noises from adjacent residences.

AIR CONDITIONING

While 13% of all complaints received are from air conditioning equipment, few difficulties have been experienced in enforcing the provisions of the By-law. The owner of an air conditioner is usually anxious to avoid disturbing his neighbour and generally takes whatever steps are required for harmony, peace and quiet.

CONSTRUCTION

Twelve percent of all noise complaints received during 1974-81 concerned construction sites and equipment. All major construction sites, public and

private, are regularly inspected to make sure that excessive noise is not being generated from equipment operated on site.

In general, when a construction project commences, a visit is made to the site and a meeting is held at which the Site Superintendent is advised of the provisions of the Anti-Noise By-law. A follow-up inspection is then made at least once a week by one of my staff and will continue until construction has been substantially completed. Over the past eight years, some 3,500 inspections of this type have been carried out. Most contractors and their site management staff are aware of the existence of the Anti-Noise By-law and are accustomed to my inspections. As a result of these inspections, noise control measures have become an integral part of the management of construction sites within the City of Toronto.

The complaints can be broken down as follows:

Night trowelling of concrete -	28%
Daytime equipment operation -	25%
Early start-up of machines -	19%
Night operations - forms, etc. -	12%
Night - Public Utility, City & Metro construction -	7%

Seventy-five percent of the noise complaints in regard to construction sites concern operations occurring during night or early morning hours and the largest group, 28 percent, of complaints concern the noise from gasoline powered trowels. These trowels, which are used to finish large areas of concrete, generate a high level of noise, 85-95 dB(A) at seven metres under normal operation.

The City of Toronto By-law No. 44-75 prohibits disturbing noise from construction sites between the hours of 1800 hours of one day and 0700 hours of the next following day, except in cases of public convenience or necessity. Certain factors govern the pouring of concrete floors, viz:

1. A time period must lapse after the pouring of concrete before the material sets sufficiently for the finish trowelling to commence.

2. Reinforced concrete is a structural material and the structural design of the building and the location of expansion joints, supporting walls and columns dictate the size of a concrete pour.

3. The time period for setting is affected by temperature, humidity and chemical agents.

These factors can and do cause a variance in the time during which the finishing of floors can commence; in cooler, changeable weather, it is usually conceded that machine trowelling is a matter of necessity until 2100 hours.

In circumstances where "beyond control" delays occur, an extension may be required. In such cases, hand trowelling or the use of electric machines is desirable.

Electric powered trowels generate about half the noise of gasoline powered machines. They are, however, smaller and less powerful and, because of the extension cable required, are more difficult to use. These electric powered trowels are widely used in closed locations where the exhaust fumes from gasoline engines are dangerous. They are not, however, in general, used by builders where more powerful gasoline powered machines can be used.

It must be recognized that, where this activity occurs, my Noise Control Inspector is limited to determining whether late night trowelling is a matter of necessity or not. If the pour was commenced early in the day and was carried out with reasonable despatch, but could not be finished within the hours of the By-law, then the finishing must be completed as a matter of necessity. Where my inspector determines that different practices could be followed which would result in an earlier completion or a reduction in noise being emitted, he would then conclude that it was not a matter of necessity and would insist on full compliance with the By-law.

At the start of excavation, there is often a considerable amount of noise from early morning starting of equipment or trucks hauling soil from the site; if this has not already been noticed by my inspector, nearby residents soon contact my Noise Control Branch - they are usually able to obtain compliance with the By-law.

Where public safety is involved, certain types of work must be undertaken at night. Erection of flying forms and hoisting of precast facing slabs usually involve the moving of large objects over street allowances and night work is necessary in the interests of safety to the public.

In these cases, to create as little disturbance as possible, extra care is used. Communication between ground and operator is by radio or telephone. An occasional accidental bang or squeak may be heard. In order to ensure minimum noise generation, a strong site discipline is required to ensure that shouting of orders and careless and thoughtless handling of equipment is cut to a minimum.

These operations, over street allowances, are under supervision of the Metropolitan Toronto Police Force. In addition, where complaints are received, night inspections are made by my staff.

City and Public Utility construction is also monitored. Where breaking of concrete or similar noisy work is proposed for residential areas, an 8:00 a.m. start is usually required. Works of an emergent nature, however, are exempt from By-law provisions.

INDUSTRIAL/RESIDENTIAL

Although complaints of noise from industry comprise only 5% of the total, they occur without exception where residential properties are surrounded by or adjacent to industrial areas - generally legal non-conforming uses.

Disturbing noise from industry usually falls into three categories:

1. New noise from recently installed equipment

2. New noise from mechanical faults in existing equipment

3. The multiple-source noise which is associated with heavy industrial areas.

Experience shows that industry usually pursues a "good neighbour" policy and will try to deal quickly with the "new noise" categories when advised of the community's concern.

When the objection is to the normal noise associated with the operation of an industry in an industrial zone, one has to recognize that people living in such an environment cannot be immune to these noises. If a person purchases or rents a house in the vicinity of an industrial facility, which, in the course of its normal operation, produces a certain amount of unavoidable noise, I can only assume that the resident, upon occupancy, has accepted the existing conditions.

REFUSE COLLECTION EQUIPMENT - NOISE COMPLAINTS

A common cause of complaint by citizens in the downtown area is disturbing noise from refuse collecting equipment during the late night hours.

Due to the many enclaves of residential use in the downtown area - and they are increasing in number - the noise from these late night operations is becoming more and more important. During the eight years, 1974-1981, a total of 331 complaints were registered with the Department of Public Works, representing 5% of the total of all noise complaints received within these years. Almost without exception, the complaints have been from the downtown area and are primarily concerned with the time the pick-ups are made.

As I have previously reported to your Committee, nighttime pick-ups in the downtown core by City forces are unavoidable. Notwithstanding this, when complaints of nighttime noise from City pick-ups are received, they are rescheduled, whenever possible.

Where these complaints concern private refuse collectors, they are required to reschedule their pick-up times.

NOISE MONITORING

Council has approved the continued monitoring of sound levels across the City. The programme involves the taking of noise samples at the intersections of a quarter mile orthogonal grid superimposed on the City and captures the following measurements:

(a) The residual or background level (L90) which is taken as the level of sound exceeded for 90% of the time.

(b) The median or (L50) level which is the level of sound exceeded for 50% of the time and the measure of prominent events or (L10) which is taken as the level of sound exceeded for 10% of the time.

(c) The sound level equivalent or (Leq) which is the constant level of sound which would result from the total sound energy, however varied, over the same period.

To monitor the complete area of the City of Toronto requires a period of 42 months and involves measurements at 569 points. The second monitoring of the City was completed in 1981, and some points have been recorded for the third time. In addition to this work, 308 special monitorings have also been taken. A breakdown of the completed monitoring work is shown in Table No. 4.

TABLE NO. 4

BREAKDOWN OF POINTS MONITORED AND DATA RECORDED

Year	Regular	Special	Equipment Malfunctions	Aborted Due to Weather	Completed
1974	178	86	17	30	217
1975	99	112	24	42	145
1976	234	18	30	39	183
1977	164	7	21	53	97
1978	190	15	24	11	170
1979	148	22	10	18	142
1980	115	14	3	17	109
1981	78	34	4	9	99
Totals	1206	308	133	219	1162

The monitoring programme gives me the ability to observe and investigate changes which occur in the urban noise climate. Prompt action to these changes when identified will make it possible to improve and control the noise environment of the City of Toronto to a greater degree in the years to come.

Table 5 provides a comparison of 24 hour Leq levels resulting from the first and second monitoring over a period of approximately 7 years.

TABLE NO. 5

COMPARISON OF AVERAGE LEVELS
Including 24 Hour Leq Levels

Observation Number	Area	L10	L50	L90	Leq
1st Monitor	East	67	59	51	65
2nd Monitor		65	57	50	64
1st Monitor	North	66	57	48	64
2nd Monitor		61	53	46	60
1st Monitor	West	66	58	50	64
2nd Monitor		63	56	48	62
1st Monitor	Central	68	60	53	67
2nd Monitor	Core	68	61	54	67

Each completed cycle of monitoring gives more data for analysis and specific trends may be established. Map 1 shows the twenty-four hour Leq levels obtained across the entire City from the second monitoring cycle.

TABLE NO. 6

POSSIBLE CAUSES OF 4 dB(A)+ RISES
In 24 Hour Leq Levels

Possible Cause	No. of Points	% of Total Points
Increased Traffic Movement	14	25
Land Use Change	8	14
Increased Machine Noise	4	7
People Noise - Voices, Tire Squeals, Dogs, Etc.	5	9
Construction	12	21
More Trains Recorded	6	10
Weather (Rain, Thunder)	3	5
No Apparent Reason	5	9
Totals	57	100

Analysis of the data now available shows that a number of changes have occurred in sound pressure levels. Table 6 gives a listing of the grid points which, after 4 years, have experienced an increase of greater than 4 dBA in the 24 hour Leq. The location of these grid points is shown on Map 2.

The figure of +/- 4 dBA represents the greatest possible error which could be expected to occur between the comparison of "Black Box" readings each having a possible +/- 2 dBA error in its readings.

Thus, a variation of greater than +/- 4 dBA in the twenty-four hour Leq would indicate a possible change in the sound environment at that location. It must be realized that variables exist which affect the day to day average level of sound at a point due to natural causes; these are wind direction and strength, height and "smoothness" of adjacent structures, and time of year which affects length of day and climatic changes. In this regard there exists very little documentation on the daily sound level variations possible in the urban environment and it is one of the investigations that I intended to carry out.

The comparison shows that average Leq noise levels (Table 5) over the twenty-four hour period are decreasing, those in the East and Central Core by a single decibel or less, while the levels in the North and West on the average have dropped by three or four decibels. This change in average level could be brought about by either a shortening in the duration of a sound, or by a reduction in the level of the sound over the same period of time. The L90 value indicates that the residual or background level has decreased by about one decibel in most cases;

the other two values shown, the L50 or median level, and the L10 which is the intrusive or prominent level, have decreased by from one to two decibels. Consideration of these changes indicates that a reduction in the higher levels of sound is actually what is taking place all over the City, rather than a shortening of the duration of sound.

A look at Table 6 provides an insight into the possible causes of the increase in sound levels at certain grid points which experienced a rise in the sound level on the second monitoring. The prime cause is increased traffic movement which accounts for 25% of the increases in sound levels. This does not necessarily mean an increase in the traffic flow, since a change in the traffic pattern causing increased starting or stopping, or the addition of parking in the vicinity, might well cause the same result. The next highest cause of increase in sound levels is construction noise, which is of a temporary nature, thus permitting sound conditions to return to their previous low level on completion of the construction work. However, if the work has brought about a change in land use, the sound levels may not return to their original values, as the third highest cause of rising sound levels is change in land use at 14% of the total.

These first three changes in sound level account for 60% of the total. Train noise accounted for 10% of the remaining 40%, with an increase in the number of train pass-bys recorded. A further 9% of the increase in sound level was the product of noise of a transitory nature, i.e. people noise. The remaining percentage, made up of sporadic machine noise, weather noise and unaccountable noise, all, again, noises of a temporary nature, complete the analysis.

In summary, 39% of the noise level increase can be attributed to an increase in traffic noise and/or change in land use and are attributable to the following:

1. Allen Expressway Extension and Subway
2. Campeau Development at the foot of Yonge Street
3. Harbourfront
4. Bay-Bloor Area

The other 61% of the changes in noise level are not of a permanent nature and will be of interest when the next round of monitoring is completed.

Recommendation

That the Grid Point Monitoring Programme be continued.

In addition to the regular monitoring programme, several special monitoring projects were carried out either to extract information for my Department or for the Planning and Development Department. The results of these projects are summarized in Table No. 7.

TABLE NO. 7

NEIGHBOURHOOD SURVEYS

Area	Purpose	Conclusions	Reported
Moore Park	to determine effect on noise environment of traffic restrictions	substantial decreases occurred	Internal
Central Waterfront	Planning Board wanted data to assist in development planning guidelines	consistently high levels generated by traffic and industry	Planning Board meeting 2/76
King - Parliament	Planning Board wanted data for planning guidelines	data included in report	Planning Board meeting 4/75
Farnham - Balmoral	to determine effect of speed bumps on noise levels	individual vehicles were more noisy but there was a lowering of levels because drivers avoided the street	Internal
Parkdale	to determine effect on noise levels which would be caused by Formula 1 Auto Race at C.N.E	noise would be audible in the southern part of Parkdale	City Council meeting 5/12/77
Allen Road	to determine effect on noise levels of Allen Road and subway extension	residences less than 180 metres from roadway were marginally affected	Internal
Island Airport	to establish present levels prior to S.T.O.L. operation	results used in Memorandum of Understanding	City Council meeting 4/6/81

CONSTRUCTION AND SERVICE EQUIPMENT

Council has approved of a sound attenuation programme being undertaken to City equipment. The first target selected to implement Council's policy was the attenuation of the City's fleet of air compressors and garbage compactors.

AIR COMPRESSORS AND PAVEMENT BREAKERS

A number of silenced compressors were purchased and were tested on a regular basis to ensure that the low sound emission levels of the machines when new did not deteriorate.

Table 8 below summarizes the results of two years testing of these machines. The sound pressure levels recorded for the silenced compressors were within the limits of the Anti-Noise By-law, 73 dBA at 7 metres, and in some instances, the machines had lower sound pressure levels after two years of use than when first purchased. These observations attest to a manufacturer's ability to produce quieter machines and to the effectiveness of the regular maintenance procedures carried out by the Department of Purchasing and Supply. By comparison, the non-silenced machines, some of which are still in service, show average levels to be 12 to 13 decibels higher than those of the later model silenced compressors.

At the present time, a 73 dBA sound pressure level with respect to the City Anti-Noise By-law is in effect. The reduction in noise of between 10 to 15 decibels indicates that a very important source of noise has been removed from the City's noise environment.

TABLE NO. 8

SOUND PRESSURE LEVEL TESTS OF CITY SILENCED COMPRESSORS
dB(A) at 7 m - Average Levels - 4 Positions

Serial No.	Idling			Full Pressure		
	new	12 mths.	24 mths.	new	12 mths.	24 mths.
4340	61	60	65	68	68	72
4341	67	—	61	63	—	65
4342	67	79	62	68	70	69
4343	66	70	62	69	74	72
4344	—	—	63	—	—	69
4345	71	64	63	72	72	72
4346	65	—	63	69	—	70
4347	66	64	65	71	70	73
4348	64	—	62	70	—	69
4349	68	64	64	70	70	71
Average	67	66	63	69	71	70

The City's lead in purchasing these machines and adopting a level of 73 dBA at 7 metres has resulted in the replacement of older equipment by silenced units of practically all the compressors used by other agencies in the City. The members of the Public Utilities Co-ordinating Committee, which co-ordinates most of the work carried out by the Utilities on streets in the City, were the first in the private sector to require the use of silenced compressor units by their contractors.

When my inspectors come across compressors which do not conform to the By-law's sound pressure levels being used in the City, the operators are advised of the provisions of the By-law and are required to replace the machines with those that meet the required levels.

The City has purchased both 'silenced' pavement breakers and hydraulic breakers to investigate the possibility of reducing the noise caused in the breaking out of pavement. Work is still in progress and will be reported on at a later date.

GARBAGE TRUCKS

Noise from garbage compactors can be broken down into three main components:

1. Engine Noise - (a) when the truck is moving on the street under normal driving conditions, and (b) during the compaction cycle operation.

2. Compaction cycle noise due to the operation of the mechanical elements of the compacting mechanism during the compaction cycle.

3. Loading Noise - Noise caused by the loading of botties and, on occasion, due to the careless handling and banging of garbage cans on the metal hopper.

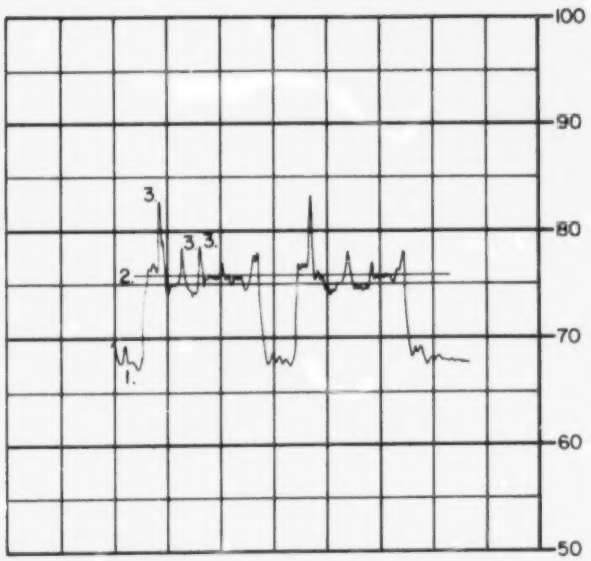
When a compactor is moving down the street under normal conditions, the engine noise is not significant; the compactor moves only for short distances and at a very slow speed, except, of course, when loaded and heading for the dump. The engine noise during moving is actually less than that which would be produced by a passing automobile moving at 40 kilometres per hour.

During the compaction cycle, which occurs while the vehicle is standing still and the transmission is in neutral, the power take-off is engaged and the engine speed is accelerated. This produces noise levels in the 70 to 75 dBA range when measured at 7 metres from the vehicle. Then, as the compaction cycle is activated to empty the hopper and force garbage into the body of the truck, there

is a rapid rise in engine speed. This increase in engine speed causes a corresponding rise in sound to about the 85 dBA level. In addition, three distinct bangs caused by the changing of direction in the packing mechanism are produced. Graphic illustrations of a typical cycle are shown in Figure 1.

FIGURE 1

P.T.O. COMPACTOR - COMPACTION CYCLE



PASSENGER SIDE

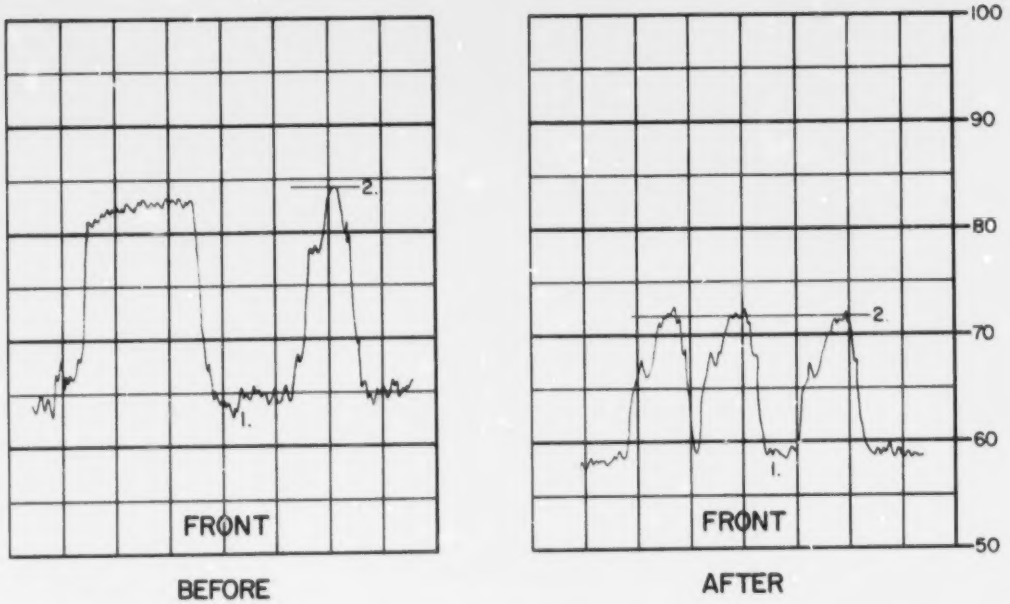
1. MOTOR IDLING.
2. MOTOR NOISE DURING COMPACTION.
3. METALLIC BANGS IN CYCLE.

In the latter part of 1977, observations were made of the operation of garbage compactors, which, instead of having transmission power take-off, utilized a front-mounted pump connected directly to the engine through a capsule clutch. This capsule clutch mechanism enables the development of sufficient hydraulic power to operate the compaction cycle at a lower engine speed. Since this seemed to offer an opportunity to substantially lower the engine noise from our packers, three machines were retrofitted with this capsule clutch to determine whether they were practical. Figure 2 shows a graphic record of compaction cycles before a machine was retrofitted with the capsule clutch and afterwards. The engine noise which is predominant at the front of the machine, was reduced from 83 dBA to 72 dBA, while at the rear, where the compaction cycle noise predominates, the engine noise was reduced from 77 dBA to about 68 dBA, disregarding the mechanical bangs which are a feature of the compaction mechanism. The difference in engine related noise amounts to a reduction in sound pressure level of more than 50%. The three bangs caused by the reversal of the compaction mechanism were not reduced to the same extent as was the engine related noise.

The machines were found to be practical and I decided to recommend purchase of this new type whenever replacement vehicles were required.

FIGURE 2

COMPARISON OF OBSERVED NOISE EMISSION OF CITY COMPACTOR
BEFORE AND AFTER RETROFITTING WITH CAPSULE CLUTCH (dB(A) at 7m)



1. Motor idling.
2. Motor noise during compaction.
3. Metallic bangs in cycle.

There are 105 compactors in the City's fleet, 37 of which are silenced. At the present rate of replacement of 15 per year, the entire fleet will be changed by 1987.

The 53 unsilenced machines which will remain to the end of 1982 could be retrofitted with the silencing package for about $125,000.00. However, I believe that the expenditure would not be warranted since they would be in service for only a short time. Also, the capital expenditure would not be reflected in any increase in trade-in value.

Using the knowledge gained from the reduction in the level of noise emissions from the City of Toronto equipment under practical operating conditions, over the months ahead I am planning to bring forward a further amendment to the City's Anti-Noise By-law to establish permissible maximum sound levels for refuse collection equipment operating within the City of Toronto.

This amendment will be introduced not later than 1987, in order to take effect on the completion of the total replacement of the City's fleet to practical "silenced" standards.

Recommendation

That the Noise Control Branch continue its evaluation of the level of noise emissions from garbage compactors, in order to establish permissible maximum sound levels for the operation of refuse collection equipment.

CONSTRUCTION EQUIPMENT

In the course of making observations on air compressors being used for construction within the City of Toronto, further observations were also made of noise levels emitted by other construction equipment operated within the City. These measurements were made in order to provide a data base for practical noise emission limits. Also, in conjunction with this area of noise emissions, a close liaison has been maintained between the Department of Public Works Noise Control Branch and the Provincial Ministry of the Environment.

Since 1979, manufacturers of construction machinery have improved the sound emission levels of their products as a result of world-wide pressure for the reduction of noise levels in construction equipment. Schedules A and B of By-law 44-75 should now be amended to recognize these improved emission levels:

SCHEDULE A TO BY-LAW NO. 44-75 RESPECTING NOISES
Sound Regulations Respecting Equipment

Type of Equipment	Measurement Distance - m	Permissible Maximum Sound Level dB(A)
Air Compressors - 70 litres per sec.	7	73
Pneumatic Pavement Breakers		
— 36 kg, manufactured prior to Jan. 1/81	7	92
— 27 kg, manufactured prior to Jan. 1/81	7	90
— all manufactured since Jan. 1/81	7	85
Heavy Construction Equipment - dozers, backhoes, mobile cranes, pile augers, trenchers		
— Heavier than 75 kW		
-mfr. 1/1/79-31/12/80	15	88
-mfr. 1/1/81 & after	15	85
— Less than 76 kW		
-mfr. 1/1/79-31/12/80	15	85
-mfr. 1/1/81 & after	15	83

SCHEDULE B TO BY-LAW NO. 44-75 RESPECTING NOISES
Sound Regulations Respecting Equipment

Type of Equipment	Measurement Distance - m	Permissible Maximum Sound Level dB(A)	Date of Enforcement
Air Compressors - 70 litres per sec.	7	73	Jan. 1, 1978
Pneumatic Pavement Breakers			
— 36 kg, manufactured prior to Jan. 1/81	7	92	Jan. 7, 1978
— 27 kg, manufactured prior to Jan. 1/81	7	90	Jan. 1, 1978
— all manufactured since Jan. 1/81	7	86	June 30, 1982
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-mfr. 1/1/79-31/12/80	15	88	June 30, 1982
-mfr. 1/1/81 & after	15	85	June 30, 1982
— Less than 76 kW			
-mfr. 1/1/79-31/12/80	15	85	June 30, 1982
-mfr. 1/1/81 & after	15	83	June 30, 1982

Recommendations

1. *That the City's 53 unsilenced garbage compactors not be retrofitted with a silencing package but be maintained until replaced with new silenced compactors.*

2. *That Schedules A and B of By-law 44-75 be amended to read:*

SCHEDULE A TO BY-LAW NO. 44-75 RESPECTING NOISES
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PUBLIC EDUCATION

Since the formation of my Noise Control Branch, the slide and sound presentation which was originally presented to Council has been updated twice and is presently available for use on call at any school in Toronto. Many presentations have been made over the past seven years, both in Toronto and in other parts of the Metropolitan area. In addition to school presentations, a number have also been given at ratepayers meetings at the request of the various Aldermen.

As an extension to these presentations, a number of information sheets have been prepared on the following subjects: central air conditioning installation, barking dogs, construction noise and noise from music, loudspeakers and so on, and combatting health problems due to noise pollution.

Other pamphlets will be prepared as the need arises and there is presently a steady stream of requests for most of these information sheets.

In 1976, notices were sent out with the water bills advising Toronto residents of the existence of my Noise Control Branch.

My staff from Noise Control have appeared a number of times on radio and television programmes and will continue to be available for requests from the media for interviews and information.

Recommendation

That the public education service provided by my Noise Control Branch be continued.

SECTION 2 - LAND USE

The following recommendation was adopted by City Council in December of 1973:

> "That City Council, so it can clearly comprehend the effect of rezoning applications on the City's noise climate, refer all applications for rezoning or land use change to the Technical Planning Committee who will report on the effect of these official plan changes on the sound environment and that the Committee on Buildings and Development be requested to report on the details of implementing such referrals."

The social perception surveys carried out in conjunction with the Noise Control Study showed that transportation, in all its forms, provided the greatest component, by far, of the City's sound environment. The noise of children playing, especially during the daylight hours, rated a poor second, while machinery, generally of the construction type, and noise of people walking and talking provided other significant components, in that order. Also, the noise monitoring programme carried out as part of the Study represented a valuable tool for the measurement of sound exposure now and for comparison in future years.

The results of the Noise Control Study clearly demonstrated the need to evaluate the impact of sound on all zoning and land use changes in the City.

As a result of the above recommendation, City Council adopted a policy in June, 1974, which required applicants requesting an Official Plan change or rezoning to submit a Noise Impact Statement which would show the means that they intended to employ to ensure that their proposal "best fits" the sound environment of the area concerned.

The required Impact Statement provides the following data:

Impact of Development on the Neighbourhood

A forecast of the impact of the sound from the traffic and/or industrial work sounds generated by development is given together with an outline of the methods used to control these sounds from issuing into the neighbourhood.

Impact of the Neighbourhood on the Development

The applicant is required to provide an analysis of the effect of the existing sound environment on the development and the provisions proposed to control any undesirable effects on the development.

Impact of the Development on Itself

The applicant is required to show the provisions proposed for control of the sounds generated within the development.

Since the adoption of this policy to the end of 1981, one hundred and sixty-two (162) Noise Impact Statements have been received and approved by my Department. Prior to 1978, all Noise Impact Statements were subject to the same review process. Due to the great volume of development activity under way in the City which ranged from the renovation of a house for professional offices to the building of a two hundred and fifty (250) suite apartment block, I implemented a more streamlined procedure to cut down on the time and data required in dealing with developments having minor noise impacts by splitting the statements into three classes:

CLASS 1

Deals with minimum impacts that can be prepared by the proponent without the need of engaging a noise consultant.

CLASS 2

Deals with projects sited within a reasonable sound environment but where, for example, the impact of noise from an improperly-designed air handling system could generate undesirable noise for the adjacent neighbours. The proponent, with the assistance of his architect, can usually analyze the effects of developments in this class.

CLASS 3

Deals with developments where a problem with the sound environment would exist unless specific steps were taken to counter the problem. The proponent is usually required to engage an acoustic consultant to work with his architect and the consultant is required to certify that the plans prepared for the project have incorporated the noise attenuation features required by the impact statement. In some instances, I also require that the consultant certify that the noise attenuation features have been properly put into place in the completed project.

Table No. 9 shows details of the number and types of statements dealt with since 1974.

TABLE NO. 9

NOISE IMPACT STATEMENTS

Year	Class 1	Class 2	Class 3	Total
Prior to 1977	—	—	—	74
1978	9	5	20	34
1979	11	2	7	20
1980	2	2	5	9
1981	12	1	12	25
Totals	34	10	44	162

The system now established for the submission and review of Noise Impact Statements, with respect to Official Plan changes and rezoning, works effectively with the minimum of red tape and cost to the proponent.

Recommendation

That City Council reaffirm its policy of requiring the submission of Noise Impact Statements by applicants requesting an Official Plan change or rezoning.

SECTION 3 - TRANSPORTATION

Two recommendations in my Noise Control Study concerning transportation sounds involved requests to the Federal Government. The first,

> "1. That the Federal Minister of Transport and the Federal Minister of the Environment reduce and/or establish maximum limits of sound generation for air and rail systems as well as Inter-Provincial bus and truck carriers in all their operating phases."

No action with respect to the enactment of the Federal legislation regarding sound generation for air and rail systems or Inter-Provincial bus or truck carriers has been taken to date.

Your Committee is aware that I am now undertaking a Rail Noise and Vibration Study in Wards 5 and 10 of the City. Phase I of this study has been completed. Results so far have indicated that:

(a) It is perceived by residents that noise is the greater and vibration the lesser of the disturbances due to the railway in both Wards 5 and 10. Ward 5 also experiences noise and vibration to a much lesser degree from truck traffic - Ward 10 not at all.

(b) The vibrations generated by the trains, as measured during Phase I, are, in general, below levels that are accepted as the sensitivity of people to feelable vibration.

(c) The vibrations are perceived to be the same in winter and in summer.

(d) The main manifestation of vibration was the rattling of windows. This is probably due to acoustic excitation (airborne sound pressure), rather than by the transmission of vibration through the ground.

Phase II of this study will focus on the investigation of noise levels generated within residences adjacent to the railway, together with a further perception study focusing within 150 metres of the railway tracks, to investigate the factors of time of occurrence and level of noise more closely.

I believe the findings of this study will lend credence to my original recommendation which should again be drawn to the attention of the Federal Government.

In the case of the second recommendation,

> "2. That the Federal Minister of Transport and the Federal Minister of the Environment reduce and/or establish maximum limits of sound generation for all motor vehicles manufactured for sale in Canada, with limits to include related equipment, such as tires."

Legislation has been enacted with respect to maximum sound limits for motor vehicles. In January of 1979, the Motor Vehicle Safety Act was amended to set emission levels for vehicles, whether manufactured in Canada or not, as follows:

(a) heavy trucks and buses - 83 dBA;

(b) light duty vehicles or off road utility vehicles - 80 dBA;

(c) snowmobiles - 78 dBA.

This provides a degree of control which will reduce vehicular noise at source.

Two further recommendations regarding transportation were aimed at Provincial authorities. Firstly,

> "1. That the Provincial Minister of Transportation and Communications and the Provincial Minister of the Environment be requested to establish stations at appropriate locations within the City of Toronto to which Metropolitan police officers can direct vehicle owners for not only safety and air emission checks but noise level conformance tests."

The Province, through the Ministry of the Environment, has undertaken considerable work in regard to the matter of vehicular noise generation. On the basis of data obtained from trial installations in British Columbia, however, it was established that the setting up of permanent stations was not practicable in urban area as variations in location, shape and size, etc., were so extensive that vehicle noise levels could not be properly pinpointed. Notwithstanding this, I understand from advice received from Provincial authorities that work is now proceeding on the development of National Standards by the Canadian Standards Association for all classes of vehicles for the purpose of establishing stationary noise emission levels for use in testing noise levels in an open urban environment. These stationary tests would correlate with the results of regulatory pass-by tests carried out in a controlled environment and would provide a means of satisfactorily checking noise emissions.

In view of this, my recommendation should stand to await the development of these standards.

My second recommendation was:

> "2. That the Provincial Minister of Transportation and Communications and the Provincial Minister of the Environment establish limits on sound level generation under operating conditions for motorized vehicles and engines of all types and for public transit systems."

No action has yet been taken by the Provincial Ministries with respect to this recommendation. While the Toronto Transit Commission is actively involved in

noise and vibration studies from transit vehicles, I am still of the opinion that the Provincial Government should establish practical sound level limits.

Recommendations

1. *That the Federal Minister of Transport and the Federal Minister of the Environment reduce and/or establish maximum limits of sound generation for air and rail systems, as well as Inter-Provincial bus and truck carriers in all their operating phases.*

2. *That the Provincial Minister of Transportation and Communications and the Provincial Minister of the Environment be requested to establish stations at appropriate locations within the City of Toronto to which Metropolitan police officers can direct vehicle owners for not only safety and air emission checks, but noise level conformance tests.*

3. *That the Provincial Minister of Transportation and Communications and the Provincial Minister of the Environment establish limits on sound level generation under operating conditions for motorized vehicles and engines of all types and for public transit systems.*

SECTION 4 - NOISE ATTENUATION IN BUILDINGS

As a result of a recommendation in my Noise Control Study, City Council, in February of 1975, authorized the formation of a panel, consisting of acoustical experts, architects, engineers and sociologists, to study ways and means of ensuring practical and economical standards for sound attenuation in buildings.

The Ontario Association of Architects, the Association of Professional Engineers of Ontario, the City of Toronto Public Works Department, the City of Toronto Planning Board and the City of Toronto Buildings and Inspections Department were represented on the sound attenuation panel.

The panel was of the opinion that Section 9.11 of the Ontario Building Code could be improved with respect to its provision for noise control. An examination was first made of the standards for residential construction and this led to a report on "Recommendation for Sound Control in Residential Buildings". The report had a wide input from both private and government sectors and detailed requirements for effective sound control measures for residential buildings.

In October of 1979, City Council endorsed the report and recommended that it be forwarded to the Building Code Branch, Province of Ontario, and the Associate Committee on the National Building Code. City Council also recommended that no further action be taken by the panel with respect to noise attenuation in non-residential buildings until such time as a favourable reaction to the report was received from the Province of Ontario.

The report was sent to the Ministry of Consumer and Commercial Relations, Building Code Branch, in November 1979 and to date the provincial authorities have not responded.

I believe that the attention of the Minister of Consumer and Commercial Relations should again be drawn to the report and I also recommend that the report be sent to the Minister of State for Urban Affairs for consideration in the matter of revisions to the National Building Code.

Recommendations

1. *That the Provincial Minister for Consumer and Commercial Relations review the report, "Sound Control in Buildings Containing Residential Occupancies", as a supplement to the Ontario Building Code.*

2. *That the Federal Minister of State for Urban Affairs review the report, "Sound Control in Buildings Containing Residential Occupancies", for consideration by the Associate Committee on the National Building Code.*

SECTION 5 - CONCLUSIONS AND SUMMARY OF RECOMMENDATIONS

Conclusions

The work of the Noise Control Branch since its inception in 1973 ensures that there is an awareness in the City of noise and the need to control it. In general, overall noise levels in the City are not increasing but are being steadily pushed back. The basic principles laid down in the Noise Control Study concerning the elimination of noise at the source and avoiding the setting of arbitrary ambient standards are being proved by results so far.

The experience and understanding being gained by my Noise Control Branch in assisting the citizens of Toronto, both with regard to their understanding of noise and the elimination of unnecessary noise, leads me to the expectation of further advances in diminishing this unseen form of pollution.

Summary of Recommendations

1. *That City Council endorse the draft proposal of the Animal Control Sub-Committee to initiate a ticket system for the enforcement of violations of the City's Anti-Noise By-law with respect to barking dogs, with the enforcement being undertaken by the Metropolitan Toronto Police Force and officials of the Toronto Humane Society.*

2. *That the Grid Point Monitoring Programme be continued.*

3. *That the City's 53 unsilenced garbage compactors not be retrofitted with a silencing package but be maintained until replaced with new silenced compactors.*

4. *That the Noise Control Branch continue its evaluation of the level of noise emissions from garbage compactors, in order to establish permissible maximum sound levels for the operation of refuse collection equipment.*

5. *That Schedules A and B of By-law 44-75 be amended to read:*

SCHEDULE A TO BY-LAW NO. 44-75 RESPECTING NOISES
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6. *That the public education service provided by my Noise Control Branch be continued.*

7. *That City Council reaffirm its policy of requiring the submission of Impact Statements by applicants requesting an Official Plan change or rezoning.*

8. *That the Federal Minister of Transport and the Federai Minister of the Environment reduce and/or establish maximum limits of sound generation for air and rail systems as well as Inter-Provincial bus and truck carriers in all their operating phases.*

9. *That the Provincial Minister of Transportation and Communications and the Provincial Minister of the Environment be requested to establish stations at approrpriate locations within the City of Toronto to which Metropolitan Toronto police officers can direct vehicle owners for not only safety and air emission checks but noise level conformance tests.*

10. *That the Provincial Minister of Transportation and Communications and the Provincial Minister of the Environment establish limits on sound level generation under operating conditions for motorized vehicles and engines of all types and for public transit systems.*

11. *That the Provincial Minister for Consumer and Commercial Affairs review the report, "Sound Control in Buildings Containing Residential Occupanies", as a supplement to the Ontario Building Code.*

12. *That the Federal Minister of State for Urban Affairs review the report, "Sound Control in Buildings Containing Residential Occupancies", for consideration by the Associate Committee on the National Building Code.*

GLOSSARY OF TECHNICAL TERMS

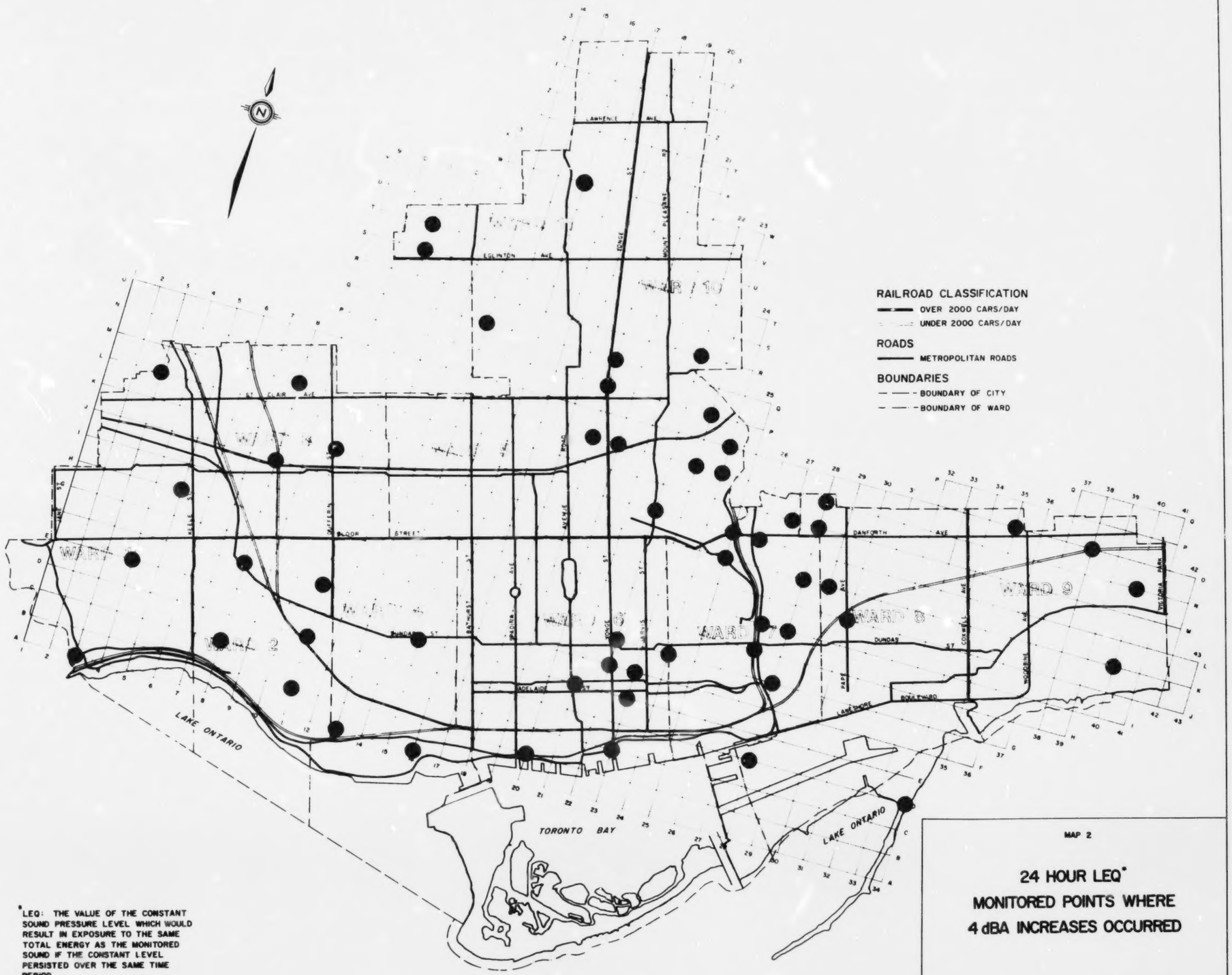
Noise	Any sound which is undesirable because it interferes with speech and hearing, OR is intense enough to damage hearing, OR is otherwise annoying.
Decibel	The decibel (abbreviated "dB") is a measure, on a logarithmic scale, of the magnitude of a particular quantity (such as sound pressure, sound power, intensity, etc.) with respect to a standard reference value and does not bear a one to one relationship with loudness or other human responses to sound.
A-Weighted Sound Level	The ear does not respond equally to sounds of all frequencies, but is less efficient at low and high frequencies than it is at medium or speech range frequencies. Thus, to obtain a single number representing the sound level of a noise containing a wide range of frequencies in a manner representative of the ear's response, it is necessary to reduce, or weight, the effects of the low and high frequencies with respect to the medium frequencies. The resultant sound level is said to be A-weighted, and the units are dB. A popular method of indicating the units, dB(A), is frequently used in this report. The A-weighted sound level is also called noise level. Sound level meters have an A-weighting network for measuring A-weighted sound level.
Background Noise	The total of all noise in a system or situation, independent of the presence of the desired signal. In acoustical measurements, strictly speaking, the term "background noise" means electrical noise in the measurement system. However, in popular usage the term "background noise" is also used with the same meaning as "residual noise".

Ambient Noise Level (L10)	The ambient noise level, for purposes of this report, follows the usage of the word "ambient" throughout the environmental sciences (except acoustics). That is, the ambient noise level which exists at any instant regardless of source. In statistical terms it is the level exceeded 10% of the time.
Median Noise Level (L50)	In statistical terms it is the level exceeded 50% of the time.
Residual Noise Level (L90)	The noise which exists at a point as a result of the combination of many distant sources, individually indistinguishable. In statistical terms, it is the level exceeded 90% of the time.
Energy Equivalent Continuous Sound (Noise) Level (Leq)	That level (decibels) which is uniform and continuous over the time period involved would produce sound energy equal to that of the variable sound being considered.

*LEQ: THE VALUE OF THE CONSTANT SOUND PRESSURE LEVEL WHICH WOULD RESULT IN EXPOSURE TO THE SAME TOTAL ENERGY AS THE MONITORED SOUND IF THE CONSTANT LEVEL PERSISTED OVER THE SAME TIME PERIOD.

MAP 1

24 HOUR EQUIVALENT SOUND ENERGY EXPOSURE LEVELS (LEQ)*



*LEQ: THE VALUE OF THE CONSTANT SOUND PRESSURE LEVEL WHICH WOULD RESULT IN EXPOSURE TO THE SAME TOTAL ENERGY AS THE MONITORED SOUND IF THE CONSTANT LEVEL PERSISTED OVER THE SAME TIME PERIOD.

MAP 2

24 HOUR LEQ*
MONITORED POINTS WHERE
4 dBA INCREASES OCCURRED